Research Note

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PERFORMANCE OF 14-YEAR-OLD PINUS PONDEROSA HYBRIDS IN WESTERN MONTANA

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ABSTRACT

Ponderosa pine progenies derived from two Montana sources grew better in western Montana than seedlings from seven seed lots from Eldorado County, California, sources. Seedlings from the western Montana source (Kootenai National Forest) had better growth than seedlings from the eastern Montana source (Helena National Forest).

Considerable tree breeding in the Western United States has been directed toward the production of ponderosa pine (Pinus ponderosa Laws.) hybrids having better survival, growth, form, or other desirable characteristics. These studies also have given considerable information on the suitability of these hybrids to the varied soils and climatic conditions. This study was conducted to determine if hybrids between the so-called Rocky Mountain form (designated P. ponderosa var. scopulorum Engelm.) growing east of the Continental Divide, and the Pacific Coast form might be more vigorous than the scopulorum parent and might be suitable for planting in the natural range of ponderosa pine in eastern Montana.

Seven lots of ponderosa pine seed were provided for this study by the Institute of Forest Genetics, Placerville, California. The mother trees grew in Eldorado County, California, and were pollinated either by wind or by pollen collected in Colorado from a scopulorum parent. Two sources of pine seed from Montana (Kootenai National Forest and Helena National Forest) were added for comparison. The nine seed lots (table 1) were sown at Savanac Nursery in western Montana on May 12, 1950, and transplanted May 17, 1951.[2] Outplantings of the 1-2 stock were established in a randomized block design on May 5, 1953, on the Custer National

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Table 1.--Lot designations assigned by the Institute of Forest Genetics

Seed parent	Pollen parent	Abbreviation
P. ponderosa--Eld.--15-32 (4000' elev.)	X P. ponderosa v. scopulorum--Colo.	PP 4000' X scop.
P. ponderosa--Eld.--15-32 (4000' elev.)	X wind	PP 4000' X wind
P. ponderosa--Eld.--4B-61 (2800' elev.)	X P. ponderosa v. scopulorum--Colo.	PP 2800' X scop.
P. ponderosa--Eld.--4B-61 (2800' elev.)	X wind	PP 2800' X wind
P. ponderosa--Eld.--12-2 (5400' elev.)	X P. ponderosa v. scopulorum--Colo.	PP 5400' X scop.
P. ponderosa--Eld.--12-2 (5400' elev.)	X wind	PP 5400' X wind
P. ponderosa--Eld.--15-32 (4000' elev.)	X P. engelmannii	PP X apache
P. ponderosa v. scopulorum--Helena N.F.	X wind	Scop. (Helena) X wind
P. ponderosa--Kootenai N.F.	X wind	PP (Kootenai) X wind

Forest (eastern Montana) and on May 11, 1953, on the Lubrecht Experimental Forest[3] (western Montana). Three blocks were established at each location, and six trees were planted in each plot. Both areas formerly grew ponderosa pine.

RESULTS

Survival of the planted trees was strongly influenced by the severity of the planting site and by the condition of the seedlings when they were lifted at the nursery. The Custer National Forest plots were abandoned in 1957 because survival had decreased to only 7 percent (inadequate for analysis). These plots were on a very droughty site; this accounted for most of the deaths. However, even on the more favorable site on the Lubrecht Forest all of the seedlings from the wind-pollinated California sources died during the summer following outplanting. Winter damage at the nursery probably caused most of these losses because many seedlings were yellowish when they were lifted. The seedlings from the California sources were tallest prior to outplanting, as shown in the following tabulation:

Seed and pollen parent abbreviation	Height (feet)
PP 2800' X wind	0.35
PP 2800' X scop.	[1]0.32
PP 4000' X wind	0.32
PP 4000' X scop.	0.27
PP 4000' X apache	0.25
PP 5400' X wind	0.29
PP 5400' X scop.	0.26
PP (Kootenai) X wind	0.28
Scop. (Helena) X wind	0.26

[1]Items underlined in both columns are sources that had surviving seedlings in 1965.

All of the PP X apache seedlings died by 1957.

[3]Maintained by the University of Montana School of Forestry.

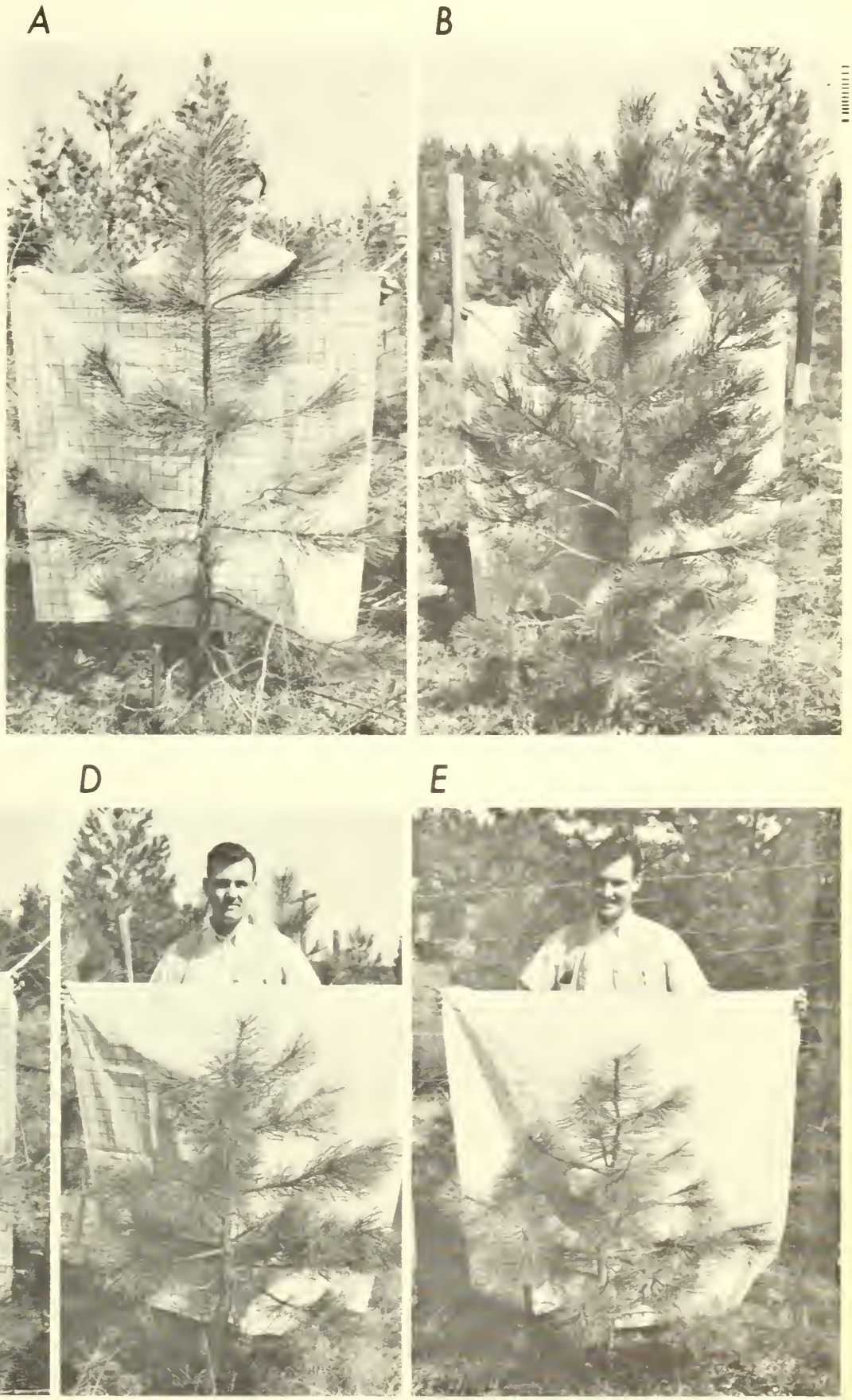

Figure 1.--Comparisons of the best 15-year-old trees of: A, PP (Kootenai) X wind; B, scop. (Helena) X wind; C, PP 5,400' X scop.; D, PP 4,000' scop.; and E, PP 2,800' X scop.

By 1965 the height of surviving seedlings showed almost a complete reversal from the heights measured in 1953 in the nursery (cf. table 2). Seedlings from PP (Kootenai) X wind seed had mediocre initial survival, but by 1965 they had grown significantly larger than seedlings from other sources (table 2). The scop. (Helena) X wind seedlings were taller than the California hybrids and had a greater crown width and diameter outside bark (d.o.b.) than the California progeny grown at elevations of 4,000 and 2,800 feet. Figure 1 shows the best tree from each group that had surviving hybrids.

Height, d.o.b., and crown width increased with elevation of the California seed source (table 2). In 1953 this pattern for height growth was exactly opposite. Growth of the hybrids from the 4,000-foot source did not vary significantly from that of hybrids from the 5,400- or 2,800-foot sources; but growth of seedlings from the 5,400- and 2,800-foot sources differed significantly.

These trees are now growing rapidly, and later measurements will show how well these juvenile traits are maintained.

Table 2.--Mean survival, height, diameter, and crown width in 1965 of seedlings growing on Lubrecht Experimental Forest

Source of P. ponderosa	Survival	Height	D.o.b.[1]	Crown width
	Percent	Feet	Inches	Feet
PP 2800' X scop.	67	[2]2.60	1.30	2.71
PP 4000' X scop.	39	4.30	1.60	3.17
PP 5400' X scop.	67	4.53	1.78	3.42
Scop. (Helena) X wind	94	5.91	1.91	3.86
PP (Kootenai) X wind	50	7.01	2.26	4.51

[1]Diameter outside bark at ground line.

[2]Means connected by the same vertical line are not significantly different at the 5-percent level.

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